

Quasi-monoenergetic ions acceleration by nanosecond laser-irradiation of solid target

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An experimental campaign aiming to investigate the laser driven light-ion acceleration in nanosecond domain has been carried out at the LENS (Laser Energy for Nuclear Science) laboratory of INFN-LNS in Catania. A Q-switched Nd:YAG laser with 1012 W/cm² laser intensity, 1064 nm fundamental wavelengths, 6 ns pulse duration, operating in single shot mode, was employed to ablate a 2 mm thick aluminum target. Advanced diagnostics tools were used for characterizing the plasma plume and ion production, including ion collectors (IC) for time-of-flight measurements, an X-ray sensitive CCD camera for the X-ray imaging and flux measurements, an intensified CCD camera for the time resolved optical imaging, a Thomson Parabola (TP) for the identification of different ion species and measurements of cut-off energy. The wide gamma of diagnostics tools now available at the LENS laboratory of INFN-LNS is allowing a deep investigation of the ion acceleration mechanism and of the interplays with the plasma parameters. The occurrence of proton acceleration with the production of a quasi-monoenergetic beam is a relevant result that will be discussed in details along the paper, including the fundamental implications in laser-target interaction and following plasma plume expansion.